NEW JERSEY TRANSIT’S EAST END CONCOURSE

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ABSTRACT

The original Penn Station New York (PSNY) was constructed at the turn of the century as part of a nationwide system of stations for the Pennsylvania Railroad Company. In 1964, the Roman Doric-style station was torn down to build a modern underground facility. Today, because of increasing ridership and the impending start of several new services, it is necessary to construct a new $105 million East End Concourse for NJ TRANSIT riders. This paper reports the history - from conception through construction - of the new 50,000 square foot East End Concourse. The new concourse will become NJ TRANSIT’s station within a station, designed to better meet the needs of customers. The East End Concourse will include passenger waiting and customer service areas, new restrooms, accessible ticket windows, additional elevators, escalators and platform staircases. These improvements will allow passengers to exit more quickly from train platforms to street level locations and provide easier access to other areas of the station. In addition to the construction of the new concourse, NJ TRANSIT has provided for a number of other upgrades to be made throughout NJ TRANSIT’s concourse, including upgrades to the signal system, more video monitors and ticket vending machines at platform and waiting areas, unique artwork throughout the station, and additional public pay phones. Construction is expected to be completed in Fall 2001.

Key words: Station, NJ TRANSIT, Penn Station New York, Vertical Circulation, Capacity Improvement
INTRODUCTION

The original Penn Station New York was constructed at the turn of the century as part of a nationwide system of stations for the Pennsylvania Railroad Company. In 1964, the Roman Doric-style station was torn down to build a modern underground facility. Today, because of increasing ridership, the success of MidTOWN Direct and the impending start of several new services, it is necessary to construct a new 50,000 sq. ft., $105 million East End Concourse for NJ TRANSIT riders. The new concourse will become NJ TRANSIT’s station within a station, designed to better meet the needs of customers.

PSNY is the busiest station along the NJ TRANSIT rail system. To better serve its riders, the new East End Concourse will be constructed and will include passenger waiting and customer service areas, accessible ticket windows, additional elevators, escalators and platform staircases. These improvements will allow passengers to exit more quickly from train platforms to street level locations and provide easier access to other areas of the station such as Amtrak, the New York City Subway and Long Island Railroad. Construction is expected to be completed in Fall 2001.

During the next five years, several new rail projects will come on line, helping to speed the commute of many northern and central New Jersey residents. The projects, which include the Montclair Connection, Hudson-Bergen Light Rail Transit System, Newark-Elizabeth Rail Link and Secaucus Transfer, are designed to better connect NJ TRANSIT’s statewide transit system and meet current capacity demands for services. MidTOWN Direct – the success of which
already transports an additional 5,700 riders a day to Penn Station New York (PSNY), creates a one seat ride into Manhattan for commuters along this line while shortening commuters trip by 20-30 minutes each way.

The station currently serves 250 NJ TRANSIT trains and over 80,000 passengers each day. When the Secaucus Transfer Station opens in 2002, allowing Main/Bergen and Pascack Valley line riders to transfer to midtown Manhattan trains, the number of passengers traveling through PSNY will increase to more than 100,000. The number of trains will also increase from 17 to 25 trains per hour due to signal system improvements. It is estimated that the ridership will be drawn from bus lines, cars and the Hoboken lines. These new projects will help NJ TRANSIT and New Jersey move into the new millennium with an upgraded, modern, and fully connected rail system.

To accommodate more rail traffic, the current signal system that controls the movement of trains in and out of the station and between Penn Station Newark and PSNY is undergoing a series of upgrades. The upgrades will allow more trains, up to 30 per hour, to enter and leave PSNY.

Through customer surveys, passengers have requested more information displays, better signage and more ticketing options. To ensure that travel with NJ TRANSIT is as pleasant an experience as possible, platform and waiting areas at PSNY will have more video monitors displaying departure and arrival times, ticket vending machines that will allow customers more purchase options and signs to direct riders to their destinations. In addition, new public address
and closed circuit television systems have been installed on Tracks 1 through 12. The systems will provide customers with updated travel information, as well as enhance safety.

Through the Arts in Transit Program, NJ TRANSIT has worked to include art throughout the transit system in a manner that integrates history and culture. For the East End Concourse location, artists were chosen through a nationwide search to create works that are interesting and unique to public transportation. To incorporate art at PSNY, the marble walls located along the new concourse area will be etched with murals depicting landscapes and scenes of New Jersey as interpreted by artist Larry Kirkland of Washington D.C. In addition, a forged-steel and kinetic sculpture, designed by George Greenamyer of Marshfield, Massachusetts, will grace the center of the split-level concourse.

**NJ TRANSIT’S NEW CONNECTIONS PROGRAM**

The New Connections Program is a compilation of projects that respond to NJ TRANSIT’s objectives to improve interconnection of NJ TRANSIT rail lines, improve passenger facilities, increase ridership capacity, improve Inter and Intra State mobility and reduce travel time.

The program is actually many projects of which the East End Concourse (EEC) in PSNY is one. All of these projects will add demand to PSNY. The overall program is in various states of development. The Waterfront, Hunter Connection and MidTOWN Direct lines are complete and in service. The Montclair Branch, Secaucus Transfer Station and High Density Signal System Improvements are under construction. The NEC Airport Station is also under construction and scheduled for completion in September 2000. The Hudson Bergen Light Rail
System opened the first operating segment in May 2000. The remainder of the Hudson Bergen Light Rail System and the Newark Elizabeth Rail Link are in development/construction. In addition to these projects, to improve service, NJ TRANSIT has ordered Bi-level cars for use within the next two years to increase train passenger carrying capacity.

The EEC is being constructed on over an acre of space within the station behind barricades painted with artwork from local schools. The daily passengers are unaware of the tremendous renovation taking place behind the scenes.

Currently in Penn Station, Amtrak services 25,000 to 30,000 riders daily. Long Island Railroad (LIRR) services 225,000 riders daily and presently NJ TRANSIT services over 80,000 riders daily. NJ TRANSIT’s passengers currently depart the platforms from a very congested and narrow corridor in the south west corner of the station, the Exit Concourse.

NJ TRANSIT surveys indicate that most of their ridership travels north and east once in midtown Manhattan. The EEC has been designed to help assist riders get to their destinations. The design and construction of the EEC was broken into three separate contracts to accelerate the overall construction staging. Prior to the construction contracts, a 99 year lease agreement was entered into by NJ TRANSIT and Amtrak for the space within the station. NJ TRANSIT is currently negotiating for 4,000 sq. ft. of property for a 31st Street Entrance from a private owner, Vornado Realty. The three contracts, two of which are complete, are the Temporary Deck Contract, Asbestos Abatement Contract and EEC Contract.
TEMPORARY DECK CONTRACT

The first of the contracts, the Temporary Deck, was advertised in June 1997 and was completed in May 1999 for a cost of $5,700,000.

The purpose of the temporary deck contract was to provide a temporary construction shield to permit further construction above the tracks, catenary and platforms with a maximum of protection for patrons from the contractor and equipment. The temporary deck separated construction zones from operating areas. The LIRR constructed a similar platform/shield for their renovation on the north half of the station.

The temporary deck is a timber construction of wood joists supported by steel stringers. The deck is located above the catenary and is scheduled for removal at the completion of the EEC project. The deck was designed to carry a live load of 125 pounds per square foot. Limited asbestos removal was required, with procedures approved by the local environmental agency, to allow connections of the new beams to the existing columns that contained asbestos fireproofing. Constructability was reviewed in-house and with Amtrak.

The deck construction was almost 100% outage dependent and, due to the difficulty in guaranteeing track outages, an allowance of 30 extra outages was included in the schedule to account for cancellations and to minimize delay claims.

The limitations of space within the project limits and within the station as a whole resulted in NJ TRANSIT identifying and arranging for storage areas for the contractor's use. The use of a portion of the Empire Yard was agreed upon with Amtrak before the contract was
advertised, however the space was not usable until cleaned, and this was also included in the contractor’s scope of work. Material delivery and waste removal was by way of high-rail vehicles. Transfer from over-the-road vehicles to high-rail or conventional rail took place at the Empire Yard, located just west of the station.

Because all the material was to be lifted up from below, the temporary deck was designed with an access hatch. It was anticipated that materials would be delivered to the Empire Yard over the road and transferred to either high rail flat cars or conventional flats powered by a prime mover. High rail cars require an Amtrak pilot and a prime mover requires an Amtrak crew. The contractor was responsible for providing his own high rail vehicles because the availability of Amtrak equipment could not be guaranteed.

The contractor’s staging area within the station was located off the stub track 5 where no catenary exists. This area was the site of an abandoned Amtrak building and tower which were demolished in preparation for the temporary deck contract, and fencing was installed to provide a secure area. Within this area the contractor was able to lift off of high rail flats or conventional flats to the deck area above. The contractor purchased a high rail truck mounted knuckle boom crane for lifting steel members from track level.

Construction was phased starting above the stub track staging area and then progressing north west and south. The contract allowed a decision tree type of staging to progress the deck based on availability of track outages.
ASBESTOS ABATEMENT CONTRACT

The second of the contracts, the Asbestos Abatement, was given notice to proceed in May 1998 and was completed in June 1999 for a cost of $1,500,000.

The contract area was broken into four work zones based on availability of the property. Area 1 was the existing Amtrak office spaces on Level B (concourse) within the confines of the footprint of the East End Concourse. Also included in Area 1 was the baggageway adjacent to the EEC, south of the existing office walls. Area 2 was that space open above the temporary deck to the underside of the Level C slab/Office Building overhead. Area 3 was the utility gallery at Level A, below the northern limits of the East End Concourse and Area 4 was the spaces occupied by retail establishments fronting on the 7th Avenue corridor along the northern limits of the project.

Abatement of the areas at Level B, the existing Amtrak office areas and the existing retail spaces were able to be performed early since they were not constrained by the temporary deck work. Once the temporary deck was complete, the abatement contractor moved into Area 2. Project coordination and sequencing were needed to allow both contracts to proceed simultaneously or, at times, in sequence. Work in the Baggageway and in Area 3 proceeded independently of work in either of the other areas. The abatement work in Area 3 was done using the Glovebag Method of containment.
Constructability and full containment requirements were reviewed by an outside firm experienced in hazardous material removal, particularly Asbestos. Criteria for lead abatement were included in the specification in the event that lead paint was encountered.

The EEC contract was advertised and awarded while the abatement contract was ongoing. Once the abatement contractor had the structure exposed in Area 2, and prior to reapplication of fireproofing, the EEC contractor was notified of the window of time available to take measurements and gather data.

The abatement contract required air monitoring throughout the course of the work and it is noteworthy that the project was completed in a public environment without any contamination outside the containment space.

EAST END CONCOURSE CONTRACT

Overview

Separate studies commissioned by New Jersey Transit and by Amtrak in 1990 confirmed that Penn Station New York (PSNY) fell short of compliance with national fire codes. Part of the solution to addressing this shortcoming was the construction of a new concourse to reduce the time required to evacuate trains and platforms in emergencies, and at the same time provide the additional capacity for projected passenger volumes.

Projection of future demand showed clearly that four concourses would be required over the south side platforms (Platforms 1-6). At present there is only one, the Exit Concourse at the Southwest end of the station.
A study performed by Sverdrup for NJ TRANSIT found that an East End Concourse, approximately opposite the LIRR ticketing concourse, would be the most effective initial investment in responding to code and capacity deficiencies.

**Project Objectives**

The objectives of the East End Concourse project, are to:

- Support the Life Safety Program at Penn Station by providing effective routes of emergency evacuation at the East End of the station.
- Increase the capacity of the station to accommodate passenger flows generated by predicted train service levels.
- Enhance the convenience, comfort and security of customers in Penn Station.
- Provide sufficient functional space for NJ TRANSIT employees assigned to Penn Station.

**Design Issues**

The three key issues that were difficult to resolve were vertical circulation, ADA compliance and the need for a control facility at the East End Concourse for management of passenger boarding operations.

It was realized that every effort should be made to provide escalators as an alternative to stairs for movement from the platforms to the concourse. This presented a dilemma because of the physical constraints of narrow platforms and multiple columns at platform level and the escalator service credit restrictions of NFPA 130. Nevertheless, the concern for comfort and convenience of all passengers, many of whom would experience difficulty in negotiating a high
flight of stairs, caused the designer to plan escalators at every location where physically possible. At each location of a vertical circulation element, maintaining acceptable platform edge clearance presented a significant design challenge.

A study was undertaken of the feasibility of providing elevator access to the new concourse. A plan was developed that incorporated elevators at the 31st Street entrance for access from the street to the concourse, and elevators in the new corridor along the west wall of the EEC, which would provide access from Level B to the platform.

All train control functions are based in the Penn Station Control Center at Ninth Avenue. Passenger information systems and communication systems for Amtrak and NJ TRANSIT are under Amtrak control. While this seemed to obviate the need for a physical facility at the East End Concourse for control or communication, a presence within the EEC was needed for emergency response and to provide a backup in the event of operational breakdowns. Therefore, communications space was included in the program.

**Design Overview**

The design of the East End Concourse features a new split-level circulation spine located at an elevation halfway between Levels A and B (designated as A-B). This location best facilitates pedestrian movement, connecting to the Hilton Corridor and the subway systems located at Level A, as well as to the Seventh Avenue corridor at Level B and gives a more open appearance to the platform access areas. The half-level rise also offers a much easier rerouting of existing mechanical and electrical infrastructure.
The architecture of the new concourse is organized around a row of columns along the main axis of the split-level. The upper parts of these columns are braced by a series of trusses with an acoustic tile ceiling above. Thus, a continuous barrel vault is formed, which diffuses light throughout the space. The freestanding columns, the metal trusswork, the vaults and the simulation of skylights all harken back to the original Pennsylvania Station designed by McKim, Meade and White, while restating these references in an appropriate architectural idiom.

The verticality of the space created by locating the new concourse at Level A-B is a major asset, and signals, through its spatial organization, the paths that passengers should take between platforms and exit gates and from station entrances to platform gates. Boarding passengers approaching the concourse from the Seventh Avenue corridor or from the 31st Street entrance will immediately be able to view and conceive all NJ TRANSIT spaces and functions. Additionally, passengers will have visual contact with the concourse level and be able to view trains approaching a specific track. The split-level provides for easy access to the Hilton Corridor at Level A which is particularly advantageous to the users of Platform 6, which has been considered for shared use with the Long Island Rail Road in the future.

As one of the three major railroads in Penn Station, NJ TRANSIT requires its own identity within the greater complex. With the East End Concourse a new identity will be achieved through its spatial quality which will harmoniously relate to current renovations in other areas of Penn Station.
Description Of The Concourse

Circulation

Development of the East End Concourse provides an advantageous distribution of stairways for code requirements along the platform. This is because the concourse is situated midway between Levels A and B. Thus, the runs for stairs and escalators are longer from Level A-B, which is higher than Level A. The stairs and escalators are positioned to reach the platforms at positions sufficiently far apart which results in less bunching of vertical circulation and more even loading at the foot of each stair/escalator. Queuing, both in daily practice and in emergency situations governed by code, tends to be more evenly distributed in terms of clearance times and queuing times for this layout of circulation elements. In addition, the new Level A-B concourse is located at a mid-point between platform and street levels, easing the transition from platform to street.

The new East End Concourse, both by quantitative and qualitative measure, offers many advantages for efficient pedestrian circulation. Evacuation times from platform level, in terms of average time per platform, maximum time per platform, and mean average evacuation time per platform, are all improved substantially over existing conditions. The design provides for seven new stairs, seven new escalators, and six new elevators from platform to concourse levels. This addition will double the existing vertical circulation for Platforms 1 to 6 in the station.

The concourse is divided into three parallel pathways and is highly directional with clear routes to street exits. The combination of a central spine and lateral pathways on a mezzanine level creates a valuable redundancy for horizontal movement through the station.
Standing crowds on one level will not easily overflow to block both levels. One or two of the parallel passageways should always be free enough to sustain easy and direct flow. The changes in level effectively segregate ticketing from main circulation, retail and waiting, while the minimal five-foot change in height ensures complete visual continuity from zone to zone.

The new Seventh Avenue entrance for NJ TRANSIT at the corner of West 31st Street will be the equivalent of a New York address for NJ TRANSIT, distinct from that of all other users. This portal will tend to become the street-side destination, not only for NJ TRANSIT patrons coming by taxi, but also for pedestrian passengers from points east of the station. The second portal to the East End Concourse will be an internal one – a Level B point of access close to the major stairways and escalators, which lead into the station from the main Seventh Avenue entrance. For those users descending into the station from this location, the portal to the NJ TRANSIT concourse will occur on the south side of the Seventh Avenue corridor.

Passenger Amenities

Accommodating ticketing, waiting, restroom facilities, and other needed passenger amenities, the East End Concourse will constitute the addition of a major space within the station complex, and substantially add to the comfort and convenience of NJ TRANSIT passengers. The restrooms and waiting areas are included for passengers prior to train arrival. The waiting area is approximately 1,400 square feet.

Handicapped accessibility is an important consideration in this project as it is in many transportation-related projects. The present station layout has elevators to Platforms 1 through 6.
from the Exit Concourse. There is a newly installed elevator that has access from Level A in the Hilton Corridor, the Seventh Avenue Corridor on Level B and the taxiway on the street level. These existing systems marginally meet the applicable standards for a transit station. Provision of additional elevators at the East End Concourse, accessible to Platforms 1 through 6, is included in the new facility.

Facility Finishes

Finish materials were selected with consideration given to the heavy use of these areas and requirements for minimum maintenance. As a result, stone, marble and ceramic tile were selected for the walls and floors. For the ceilings; metal panels with acoustic backing were specified. The overall appearance of the new concourse must be compatible with continuing improvements being made at Penn Station. Visual continuity within the entire station not only makes good design sense, but also allows tested and proven materials and techniques to be used to their full advantage. The materials selected are listed below:

Office Interior Finishes and Work  Partitioning in the office areas were determined by security requirements. Concrete Masonry Units were used where security is an issue in remittance or ticketing areas, otherwise sound attenuated gypsum wallboard partitions were specified. Wall finishes were specified to provide attractive, cost effective and easily maintained protection. Either paint or vinyl wall covering is to be used. Glass is to be installed in areas where visual contact between rooms is necessary. Wall and floor finishes in the restrooms and locker rooms were specified to be ceramic tile.
Wall materials  Walls will be covered with two different marbles that will complement the LIRR wall materials and pattern of installation. NJ TRANSIT wall areas will have two different hues of polished marble, which will be alternated in a layer pattern to develop a rich, varied appearance and coordinate with floor material color palette.

Floor materials  The floors will be a combination of granites that will be finished to provide a slip resistant surface. The obvious benefits of granite are that it is the most durable of all available floor materials, resistant to abrasion, impervious to water penetration, and stain resistant.

The granite floor was chosen to be compatible with the floor finishes installed at the Long Island Rail Road Concourse on Level A. However, the proposed honed finish is less textured than the flame finish used at LIRR and will be easier to maintain. In addition, the honed finish has some texture, and is not as slippery as polished granite. The polished black granite will provide an accent.

Columns  Column covers will be marble. Truss work at column capitals will be painted steel. Column bases will be marble.

Stairs and Railings  The stairs on the concourse level will be of the same granites listed above in honed finish with yellow tactile strips. All railings for stairs and multi-level areas will be of painted steel with satin bronze finish. The stairs to platforms will have granite treads with and abrasive cast aluminum nosing and painted steel risers. The handrails between the platforms and concourse will be satin finish stainless steel.
Ceiling Finish  The ceiling will be covered with suspended perforated and solid metal pan tiles. The ceiling will be painted to help reflect light and enhance wall and floor finishes.

Platform Gates  Platform gates and doors will be bronze clad steel with stainless steel accents. The design of the platform gates responds to the fact that these gates are an important point of arrival and departure and must accommodate clear and adequate signage showing train destination and arrival or departure time. The gates also serve as a unifying architectural element which ties all of the concourse finishes together. This helps tell users that they are in the proper location when they arrive or depart. Gates located where ceiling height permits can have a timepiece incorporated into their design, which helps symbolize the importance of time in rail station. The gates will incorporate changeable message signs, which reinforce pertinent information to the user.

Sign System

One of the keys to the efficient movement of passengers is proper and adequate signage. Destination boards and signage at gates, play a major role in passengers’ ability to determine their destination and to reach it quickly. A major consideration in the improvement of passenger circulation is the inclusion of clear, concise signage, which is easily visible to all passengers. Two types of signage will be used in the East End Concourse at Penn Station. Directional static signage will route commuters to all major areas such as ticketing, waiting, gates, and retail. Changeable message signs will be used to identify train destinations, track numbers and
departure/arrival times. All signs will be placed in strategic parts of the concourse to help expedite passenger flow through the station.

The construction of the East End Concourse and new stairways to the platforms will require a significant expansion of the existing station information system. There will be numerous sets of video monitors with train departure information at strategic locations, and automated signs at the top of the individual stairways leading to the platforms. These are in addition to the existing system, which would still be controlled by Amtrak. All train information for the shared Tracks 1-12, (Platforms 1-6) used by Amtrak and NJ TRANSIT is and will continue to be controlled by Amtrak.

The new station will be prewired for 40 ticket vending machines to allow patrons easy access to ticketing throughout the concourse.

NJ TRANSIT passengers will want to enter the station at the most convenient access point and follow the shortest possible path to their trains. Thus, many NJ TRANSIT passengers will continue to board their trains at the west end of the existing station. Likewise, already ticketed Amtrak passengers arriving in Penn Station from the east will want to take advantage of the new East End Concourse and stairways to board their trains. Therefore, it is desirable for all Amtrak and NJ Transit train departure information to be posted at all locations within the station complex (excluding the LIRR Concourse, with its largely isolated operation) and passengers should be able to descend any stairway to reach their Amtrak or NJT train.

*Static Signage*
Static Signage is a valuable way of directing passengers through the station. The design provides for a one-foot high sign band within the concourse on the top portion of the wall, which will be a convenient area to locate a majority of the static signs. Locating signs in this area will make it easier for passengers to find all signs and will avoid any headroom obstructions. Signage will be black porcelain faces with white graphics and stainless steel trim.

Changeable Message Signs

These signs will be located at each gate entrance to indicate what train is located on each track. Each sign will also identify if the train is an Amtrak or NJ TRANSIT train by using the respective logos and by color variation.

Structural Design

The new concourse required a unique structural design because it is integrated with the structure of the original Penn Station built in 1906 and the 2 Penn Plaza Office Building with associated station reconstruction performed in 1964. The structural design was able to take advantage of the excess capacity that existed in many of the 1906 columns as a result of the removal of the original station loads, however, the threading of supports for vertical circulation elements through the numerous columns and beams while still providing clearance at platform and track level was a complex challenge. The layout of the split level necessitated the removal of wind bracing members and resupport at lower levels which required concurrence of the building owners. The location of two escalators interfered with existing columns at platform level and resulted in the installation of two new columns on each side of the columns to be removed. To
allow removal of the existing column and placement of the escalators, the transfer of load to the new columns occurred at a higher elevation. The location of six elevators also resulted in column removal and girder reframing.

The key structural factors that impact the design are:

- Existing 1906 and 1964 column grids and locations.
- Curved Track alignments.
- Composition of existing foundations/grillages- reinforced and unreinforced.
- Station facilities above and below track.
- Limited space at track level.
- Active and abandoned utilities above and below track.
- Constructability within acceptable outage schedules
- Lateral stability.
- Economic design to take advantage of excess capacities.
- Design within restricted clearances- use of minipiles installed with low height drill rigs between existing utility ducts.

**Construction Schedule**

This third contract, for the construction of the structural, architectural, electrical and mechanical elements of the EEC was advertised in July 1999 and is estimated to be complete by the Fall of 2001. The completion of the EEC is needed prior to Secaucus coming on line in June of 2002.
and it is estimated that it will take a minimum of three months for NJ TRANSIT to test out, equip, staff and troubleshoot operations before the actual start of Revenue Service.

The Contractor’s bid for the project was $56,000,000.

**CHALLENGES**

**Access**

One of the first challenges that needed to be addressed was the means of access for construction materials and equipment. Based on cost, impact on rail operations and lack of reliability of available track usage, the anticipated access to the construction zone was proposed in the contract to discourage using rail delivery whenever possible. The maintenance of commuter, station, retail and office operations throughout the construction phase necessitated finding routes and times for access which were acceptable to all users and residents.

The location of two hatches in the plaza area, which was currently not in use by the building owner, provided key points for delivery and removal of materials. One of the hatches was located above the original 1906 station taxi ramp. The ramp was found to be a 13 inch reinforced concrete deck supported by 48 inch deep steel girders in good condition, and provided excellent laydown space with the capacity necessary material storage and movement. This hatch also overlapped the location of the new 31st Street Entrance and therefore a portion of the demolition was required for the final construction. The second hatch was located at the end of the ramp where all levels of construction could be reached for removal of debris without restricting movement of material around the site. The design provided for these two hatch locations in
anticipation of locating a small stationary crane between the hatches for lifting operations. The contractor applied for and was granted a permit to locate a crane adjacent to the hatches utilizing a portion of the sidewalk and street. This necessitated a separate shield for pedestrians walking on the sidewalk area between the crane and hatches.

The contract also required all deliveries and removal operations, which were anticipated to be noisy and disruptive to the normal flow of daily operations, to be restricted to evening hours. The contractor provided an evaluation demonstrating the construction noise at night to be more disruptive to local residents than the combined construction noise and daily city traffic noise would be to the office workers subjected to the operations conducted during the day. Based on this, the contractor was permitted to deliver material and remove debris during day shifts.

The location of the access hatches helped to define the staging of the construction, which was proposed to move (for both removal and installation) in a counterclockwise pattern starting in the vicinity of the eastern hatch at the south end of the project. The only exception to the staging schedule was for the work north of the split level in the vicinity of Platform 6 which was not shielded by the temporary deck and was dependent on track outages rather than access constraints. This area of the project, which could be separated from the remainder of the construction by barricades, also provided for early use of the new vertical circulation from Platform 6 to Level A, adjacent to the Hilton Corridor.
Track Outages

NJ TRANSIT set design criteria early in the project to provide for construction that did not require track outages. This resulted in numerous workshops being held throughout the design to review platform clearances, type of temporary barricades, types of equipment and suggested staging options that could be included in the contract specifications to limit the need for track outages. The temporary deck’s main purpose was to provide for a construction zone over the active tracks where construction could proceed without needing outages. Wherever possible, designs were modified to limit construction within track clearance envelopes. Where track outages were required (for lifting and lowering over tracks that were not shielded by the temporary deck), the specification provided for an allowance of track outages which included an estimation of cancellations of outages.

Platform Edge Clearances

The existing platforms are very narrow and have numerous columns that further restrict the usable space for passengers and baggage carts. The task of providing the desirable 5-ft. distance from any obstruction to the edge of platform was a true challenge that involved all disciplines in the design. The numerous curved tracks, tapered platforms, utilities and 1906 and 1964 structural framing create a maze of obstructions that limit the locations for any new construction. Threading new vertical access into the facility was a difficult task that was very often controlled by the need to provide adequate edge distance at the platform level. Workshops were held to
investigate and obtain Amtrak’s approval for clearances at each stair, escalator and elevator added to the platforms.

**Differing Site Conditions**

Working within a facility the age of Penn Station, it is reasonable to expect and anticipate differing site conditions would be uncovered during construction. Anticipating this, NJ TRANSIT provided contingency allocations in the contract to permit the project manager to review and fund unexpected changes without delaying the project and returning to the Board for allocation of additional funds.

The amount of survey that could be performed on a structure which is encased and covered by finishes was limited. In addition, the encasement and finishes often hid the condition of structure behind the enclosures. Survey was also limited to those areas that could be exposed and often utilities were buried or installed in locations that did not match record drawings. The details provided to the contractor at the time of bidding were only as accurate as the survey performed. NJ TRANSIT performed extensive survey to develop existing conditions, however the limitations on physical survey resulted in finding conditions that varied once construction started.

Once the demolition of the walls was performed under the abatement contract it was found that several of the structural beams and columns were severely deteriorated and in need of repair. It was also noted that water was leaking in several locations and the cause of these leaks had to be found and stopped so that new construction would not continue to be subjected to the
water infiltration. This required extensive coordination with the building owner responsible for the taxiway above which was leaking and with the owner of 2 Penn Plaza for modifications to planter drains which were another cause of water damage. Excavation under one of the platforms uncovered an undocumented sewer line that was leaking and as a result contaminated soil had to be removed before the foundation construction in the area could proceed. During demolition of the wall to the baggageway several undocumented telecommunications conduits were found which resulted in moving the doorway in conflict to reduce the cost needed to relocate the conduits and cables.

The operating railroads do not have the funds needed to remove services that are abandoned over the years. The build up of non-functioning plumbing, heating, electrical and communications services within PSNY has resulted in limited space available to provide new utility runs without the removal of the abandoned services. The identification of these lines has taken time and coordination during construction to provide clearances for new services to be installed and has also had schedule impacts.

**Coordination**

The facility that is PSNY is an ever changing environment that has three operating railroads servicing the area. The age of the facility and increased demand has lead to major improvements being performed by each of the agencies in an effort to respond to customer needs. Amtrak is undertaking a Life Safety Program to increase the smoke evacuation performance of the facility and to upgrade the power service to the building. Amtrak is also constructing a High Speed Rail
Program which, similar to NJ TRANSIT, is adding escalators, improved facilities, signage, waiting areas, ticketing and restrooms for the users. The LIRR recently completed major renovations to their facilities but continue regular maintenance contracts within the facility. Vornado Realty, owners of 2 Penn Plaza also performs regular maintenance and upgrades to the facility in response to tenant needs. The performance of a major rehabilitation contract within the confines of limited space being modified by several other users is a true challenge for both cooperation and coordination.

A set of contract documents is typically completed six to eight months before the construction actually begins and construction lasts between two and three years. Within this time major modifications have often been made to the areas under consideration. Unless the plans of all the other projects are reviewed and integrated, not only in detail but in schedule, there is a potential for claims or project delays. Even with coordination efforts, unexpected changes will occur. NJ TRANSIT went through detailed procedures within their specifications to require coordination with other ongoing projects, piggybacking outages with other projects, staging relocation of services during construction and actually increasing the length of the contract to account for delays and track outage cancellations. NJ TRANSIT not only provided for contingencies in the contract but increased the actual construction schedule to be fair and reasonable about the impact of last minute cancellations. NJ TRANSIT’s specifications provided detailed compensation rules for labor and equipment which is impacted by cancellation of outages. NJ TRANSIT also provided detailed staging plans to relocate offices and services being
displaced by the new construction and worked closely with Amtrak to obtain consensus of design.

Six separate lease agreements were needed to complete the project. The first agreement with Amtrak was for a ninety-nine year lease of the space that the EEC occupies. The second agreement was with Vornado Realty to remove limited sections of the asbestos fireproofing on their columns and the underside of their building in order to construct the temporary deck. Four additional agreements were also needed with Vornado to reconfigure the wind bracing, to obtain permission to construct the access hatches, to acquire the property that is the location of the 31st Street Entrance and to provide for coordinated redesign and construction of the 31st Street Entrance.

Modification of Existing Framing

The location of the new split-level concourse resulted in the need to eliminate several of the lateral bracing members of the existing 2 Penn Plaza Office Building in order to provide for open space between Level A and B. The modified lateral bracing system has the equivalent dynamic characteristic properties to respond to the loads of the original bracing. The design provided a sequence of installation for new bracing prior to removal of existing members to maintain framing stability.

Requirements for increased headroom and lower floor elevations necessitated cutting down several of the deep girders framing the original buildings. Clearance requirements for elevators and escalators resulted in the partial removal of columns. The operations for cutting,
repairing, strengthening and modifying the girders and columns were detailed and the procedures included staging, sequence, jacking and monitoring operations.

In locations where strengthening of existing columns was provided by altering the boundary conditions, additional bracing was added to reduce unsupported lengths. In some locations strengthening was performed by reinforcing the columns. Each method of strengthening was evaluated for constructability, cost and impact on station operations.

**Foundations**

New foundations were needed where new columns were being installed and where additional loads were added to existing columns that had limited foundation capacities. The limited space at track level and clearance limitations above the foundations imposed by the two existing structures, along with Amtrak train operations requirements, made constructable designs for new columns and foundations very difficult. Some of the original foundations were designed to carry the anticipated load in the column rather than the column capacity therefore even if the column had reserve capacity for loading the foundation needed to be reinforced. The foundations that were added in 1964, in some instances were also found to be limited to the capacity of the anticipated loads in the columns in order to reduce the size of the foundation, which was installed adjacent to the existing foundations and tracks. While it was often possible to add load for the new station to the columns, it was found that the foundations needed to be reinforced. To accommodate the additional loads with the limited headroom and congestion in the area of the
existing foundations, steel grillages supported by new mini-pile foundations with cap beams were designed to bypass the existing installation

CONCLUSION

NJ TRANSIT’s East End Concourse a “station within a station” will provide a stronger identity for NJ Transit in Penn Station New York. The project is a direct response by NJ TRANSIT to the increased ridership and needs of the New Jersey commuters. The project will provide increased vertical circulation, expansion of the current facility, other system improvements, waiting room, ticketing areas, customer service areas and accessible ticket windows. In keeping with NJ TRANSIT’s need to provide for customer services they have provided for future growth within the station with provision for additional information monitors and ticket vending machines. Their design is responsive to the historic nature of the building as well as the modern use of the facility. The station, which is due to open for revenue service before Secaucus comes on line in June of 2002, is under construction and anticipating a welcome reception by all NJ TRANSIT commuters.

ACKNOWLEDGEMENTS

A project the size and scope of the PSNY East End Concourse requires the dedicated efforts of all the participants. The Owner- NJ Transit provided the overall program vision and guidance throughout the many phases from study through construction. Amtrak – the Station Owner, provided valuable information through workshops, providing access to record documents and made the project possible, leasing the space to NJ TRANSIT. Sverdrup & Parcel Consultants,
Inc. performed the study, design and construction phase services on all three projects for the architecture, structural and electrical design with Maitra providing the HVAC and plumbing designs. Yonkers Contracting is the prime contractor on the East End Concourse construction providing overall project management and steel construction. O’Brien Kreitzberg are the construction managers for NJ Transit and have overseen all three construction contracts to date.